

Indigenous artificial limb of *Bombax ceiba* L. (Bombacaceae) wood-A novel ethnobotanical use

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Received:15 May 2017

Accepted:18 Oct 2017

Abstract

Bombax ceiba L. (*Semal*) is a large, deciduous tree which is very popular among indigenous communities for its multidimensional importance. It is not only a part of various socio-cultural rituals and traditions but also a part of ethnomedicine. Its wood, silk-cotton and seed-oil are very valuable in commerce. The present communication is about documentation of a novel use of wood of *B. ceiba* for preparation of an artificial limb from a tribal dominated region Kotra, near Udaipur, Rajasthan. This use of its wood has been reported for the first time and opens up the newer avenues to utilize the economic potential of the tree as a novel bio-resource.

Keywords: Silk-Cotton tree, Prosthetic limb, Match-stick, Ethnobotany

Introduction

Bombax ceiba L. (Bombacaceae) is one of the most significant tree species among tribal communities. It is distributed throughout the hotter parts of the world and grows abundantly in the dry deciduous forests of the country. This large tree is armed with hard, conical spines; pentafoliate leaves and bears beautiful scarlet red flowers during January-March. It reaches a height up to 40 meters with its characteristic horizontally spreading branches and sometimes called as 'King of the Forest'. It is also known by names such as *Shalmali*, *Simal*, *Simbal*, *Shimul*, Silk Cotton Tree and Indian Red Kapok Tree in different languages (Chadha, 1972). Many of its morphological characters are depicted in its various Sanskrit names such as *Kantakdruma*, *Nirgandhpushpi*, *Raktapushpa*, *Panchparni*, *Sthulphala*, etc. which may be of interest to the scholars of philology (Jain, 2016).

There are many ethnobotanical uses of *B. ceiba* as reported from all over the country. Ethnomedicinally, almost all parts such as its stem, bark, thorns, gum, leaves, flowers, fruits, seeds, silk-cotton and roots are employed to treat various diseases of mankind as well as livestock (Jain, 1991; Jain and Jain, 2016). Its young floral buds and fleshy calyces are used as vegetable (Jain, 1996). Tap roots of tree are edible and known as '*Semar kanda*'/'*Semal musli*'. They are rich in calcium, protein and phenolic content (Chadha, 1972). In folk medicine, roots are used for treatment of diabetes, heart disease, leucorrhoea, impotence, debility, diarrhea and dysentery (Jain and Jain, 2016). Its thorn powder is mixed with milk/water and used to remove acne on face by indigenous people (Gupta *et al.*, 2004). Gum extracted from stem-bark is known as '*Mochrasa*' and employed in ethnomedicine for treatment of asthma, debility, diarrhea and dysentery and also used for binding the books (Jain and Verma, 2012; Bose *et al.*, 1998).

B. ceiba tree is also a part of many socio-cultural customs, rituals and beliefs. For example, tribal communities dwelling in Deogudis, Chhattisgarh believe that God 'Baskoddo' and Goddess 'Kali Mata' reside on the tree (Jain, 2012). Female tree spirits 'Yakshis' are also believed to reside on *B. ceiba* tree hence, it is worshipped by women for gift of children (Gupta, 1995). As considered sacred, in *Chaitra* month, *Neja* (piece of red cloth containing Coconut, jaggery and coins) collecting competition is conducted every year on a particular day in Udaipur, Rajasthan. All *Neja* are tied high on the tree and then collected by person who wins in climbing the thorny tree (Jain and Verma, 2015). It is also considered as a mythological character 'Bhakta Prahlad' and burnt in huge quantities for *Holika-dahan* in southern Rajasthan. This tradition has raised questions of its survival and therefore, attempts for conservation of *B. ceiba* have also started (Jain, 2017).

Its wood is employed to make traditional musical instruments like *Dholak* and *Tambura* and some domestic articles like *Chatu* (ladles) etc. by tribal communities of Rajasthan (Joshi, 1995; Choudhary *et al.*, 2008; Jain *et al.*, 2009). Wood is also utilized to prepare decorative artifacts among aboriginal art industry in Australia (Griffiths *et al.*, 2003). The present communication reports a novel ethnobotanical use of wood of *B. ceiba* as observed during a field trip to Kotra in Udaipur, Rajasthan.

2. Observation

Ethnobotanical field trips were made to *Kotra Tehsil*, situated approximately 110 km far from Udaipur district, Rajasthan. The area is dominated by tribes such as *Damor* and *Kathodi*

and rich in floristic diversity. During a visit to the study area, authors met a 41 years old tribal man named Veerma Damor, living in *Dhedmariya phala* whose right hand and left leg were amputated at his adolescence after an accident of electric current injury. It was interesting to observe that he was wearing an indigenous artificial leg prepared from the wood of *B. ceiba*, walking briskly, comfortably and doing his all daily activities. On inquiry, he informed that due to poverty and lack of appropriate medical facilities in the village, he was left with no option but to make an artificial leg on his own. At the age of 27 years, he tried this with a branch of a huge tree of *B. ceiba* which was growing nearby his house and got success in his first attempt. For its preparation, a thick branch of the tree was cut, spines removed and then two hollow pieces of the wood were joined with the help of wire and nails. The upper part was grooved so that he can tie with the leg stump and the lower part was covered with thick rubber sheet as a sole of the wooden limb. In this way, an artificial prosthetic leg has been created from its wood (Fig. 1-4). This is the first report of use of wood of *B. ceiba* for preparing artificial limbs.

The basic idea of his for selecting the wood of *B. ceiba* was that it was light in weight, heat and water resistant and easily available near to his house. However, with constant use, the artificial wooden leg doesn't last for more than 1.5 to 2 years and requires new one. He further stressed that convenience and comfort overcome the relatively short span of the artificial leg.



Fig.1 One of the authors taking interview with informant



Fig.2 Informant showing his artificial wooden leg



Fig.3 Indigenous artificial limb made up of *Bombax ceiba* L. wood



Fig.4 Informant wearing indigenous prosthetic leg

3. Results & Discussion

Indigenous communities are treasure house of novel innovations which should be documented at the earliest for optimal utilization of resources as well as to preserve the bio-cultural heritage. Utilization of wood of *B. ceiba* for making an artificial limb is hitherto unreported ethnobotanical use of the plant. The most possible reasons for using its wood are softness and lightness of wood, durability as well as easy availability of the tree as one huge tree was growing in vicinity of the informant. The ease in preparation along with cost-effectiveness must be few other reasons which compelled him to utilize its wood.

B. ceiba has been included in the list of World's economic plants for its valuable wood and fiber (Wiersema and Leon, 1999). Its timber is mainly utilized for match-stick production in the country. Besides this, it is also used for planking ceilings, making canoes, boats, catamarans, shingles, toys, pencils, pen-holders, veneers, scabbards, coffins, brush-handles, picture frames, fruit crates, packing cases, wooden sculptures, cushions for mine-props, inside partition of opium-chests, paper pulp and artifact production (Chadha, 1972; Pandey, 2005; Griffiths *et al.*, 2003). Rajasthan is very much popular for its 'Jaipur Foot'- the centre of making artificial limbs at Jaipur. The main wood which is being used there to prepare the prosthetics is of *Ardoo i.e. Ailanthus excelsa* Roxb. (Family - Simaroubaceae). The present indigenous use of wood of *B. ceiba* indicates its future economic potential to be utilized for making prosthetic limbs.

B. ceiba is a multi-purpose tree species having spiritual, medicinal, ecological, commercial and

socio-cultural importance. It is a revered tree since ancient times and has been mentioned in epics and scriptures (Jain, 2012). Since it is a drought resistant plant species and requires relatively less water for survival; it could be planted at most of the places very easily. Commercially, Kapok (Silk-cotton) fiber obtained from its fruits, is used to fill life-belts, life-saving appliances, sleeping bags, mattresses, cushions, pillows, upholstery, wadded cloth quilts and also used as an insulating material for refrigerators, soundproof covers and walls (Chadha, 1972; Jain and Verma, 2012).

Its various parts are employed for treatment of diseases like diabetes, heart disease, gastro-intestinal and gynecological disorders, skin diseases, anemia, impotence, debility, kidney stones etc. in ethnomedicine (Jain, 1991; Jain and Jain, 2016). Various *in vitro*, *in vivo* experimental and clinical studies across the world have demonstrated its hypoglycemic, hypotensive, antioxidant, anti-hyperlipidemic, anti-inflammatory, androgenic, anabolic, antipyretic, analgesic, antimicrobial, anthelmintic, antihepatitis-B virus, anti-proliferative, anti-ulcerogenic, antisecretory, fibrinolysis enhancing, larvicidal and hepato-protective potential and thereby scientifically validating many of the folk claims (Jain and Verma, 2012; Gupta *et al.*, 2004; Jain *et al.*, 2012; De *et al.*, 2012; Wang *et al.*, 2013; Tundis *et al.*, 2014; Jain and Verma, 2014; Hussain *et al.*, 2015).

4. Conclusion

B. ceiba has its impact on almost every sphere of life such as social customs, folk songs, folk tales, materials, medicine, and environment. Looking to its multi-potential, *B. ceiba* could be promoted as revenue generating bio-resource

in Indian forests. In areas of its abundance, economic potential of this tree species must be highlighted among the dwelling population to create an alternate source of livelihood. The present ethnobotanical use of the tree further advocates its utility among tribal communities and therefore, it is an urgent need to document the traditional and indigenous knowledge for welfare of human being.

Acknowledgements

Authors are thankful to the informant for sharing his innovation and forest officers for their help in the field trips.

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Captions to Illustrations

Fig. 1 – One of the authors taking interview with informant

Fig. 2 – Informant showing his artificial wooden leg

Fig. 3 – Indigenous artificial limb made up of *Bombax ceiba* L. wood

Fig. 4 – Informant wearing indigenous prosthetic leg